The Structure of the Obsessive-Compulsive Brain

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Obsessive-compulsive disorder (OCD) is a neuropsychiatric disorder, characterized by recurrent intrusive thoughts – obsessions – and repetitive ritualistic behaviors – compulsions – that are distressing and debilitating for patients. Structural MRI studies investigating the neural correlates of OCD have been numerous. Nevertheless, results of these studies have not always been consistent. A key issue of these studies is the lack of reproducibility due to small sample sizes and variation in data processing and analyses techniques. Large-scale analysis using multiple study samples may partially address these issues.

In this context, we initiated the ENIGMA OCD working group embedded in the ENIGMA (Enhancing NeuroImaging Genetics through Meta-Analysis) consortium. Our aim is to identify robust imaging markers of OCD by pooling data worldwide and by using coordinated standardized image processing and statistical analysis protocols. Currently, the ENIGMA OCD working group consists of 47 samples from 34 different institutes in 17 countries worldwide.

The aim of this thesis was to get a better understanding of the neural correlates of OCD, using structural neuroimaging. T1-weighted magnetic resonance imaging (MRI) scans of the ENIGMA OCD working group were analyzed with FreeSurfer. We investigated subcortical volume, cortical thickness and cortical surface area measures.

Overall, we showed subtle yet insightful morphological brain alterations in OCD. We found differential findings across the lifespan that emphasize the neurodevelopmental nature of the disease and neuroplastic changes during the course of the disease. We hypothesize that morphological brain alterations early in the development may give rise to a vulnerability to OCD, while morphological brain alterations in adult OCD patients may be a result of neuroplastic changes due to disease chronicity, comorbidities and medication use. Remarkably, we found profound effects of medication on the cortex of patients with OCD. These medication effects need to be interpreted with caution because of our cross-sectional design and a lack of detailed information about medication use. These findings however do emphasize the importance of investigating long-term effects of pharmacological interventions on the brain.

These results encourage us to think about important clinical questions e.g., related to psychotropic treatment and the relevance of potential MRI outcomes in clinical practice. The ENIGMA OCD working group is currently working on identifying putative biomarkers of treatment response by correlating pre-treatment structural MRI measures with cognitive behavioral therapy response. However, to truly be able to understand the neurodevelopmental aspect of OCD and the neuroplastic changes during the various stages of the disease, I advocate for large-scale harmonized longitudinal studies, taking into account normal neurodevelopmental and neurodegenerative processes during the lifespan.